



Fig.1.

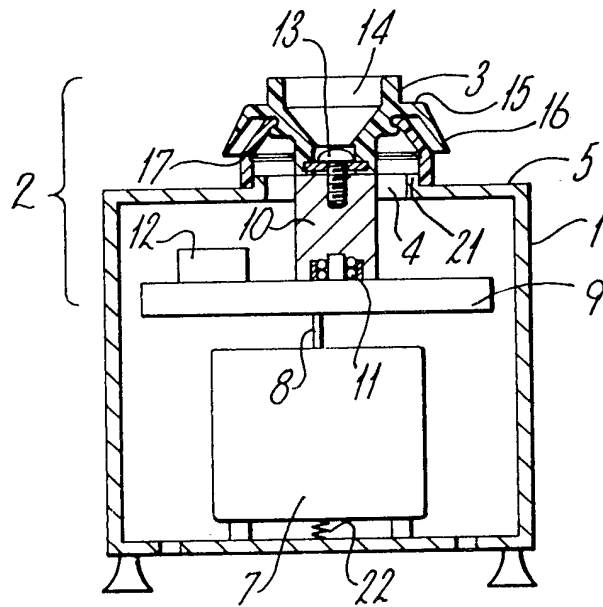
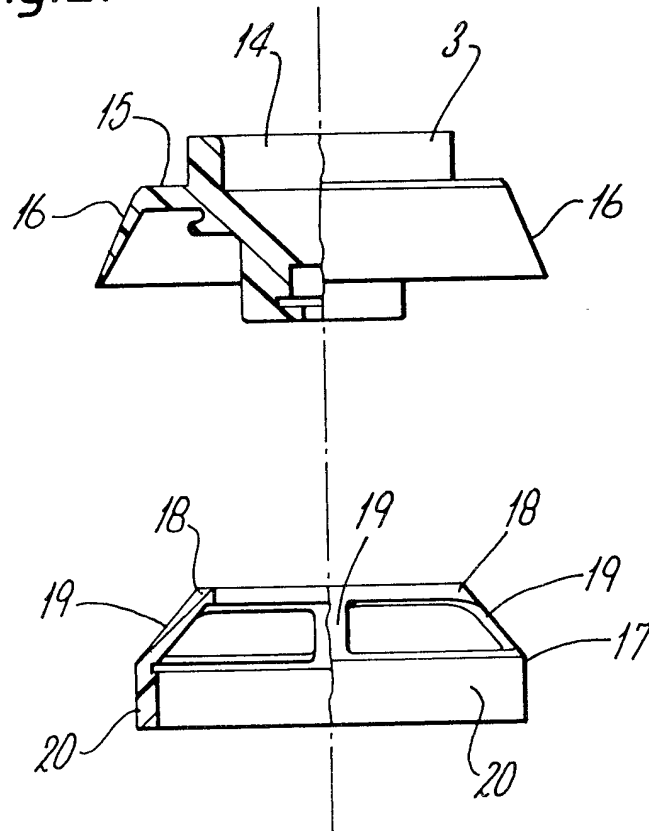


Fig. 2.



## SPECIFICATION

### Vibrating cup mixing device

5 This invention relates to a vibrating cup mixing device comprising a flexible cup rotatably mounted to undergo orbital motion relative to a drive shaft.

Vibrating cup mixing devices, generally  
10 electrically operated, are well known. Such devices are used to apply a mixing motion to the contents of a container, for example, a test tube, by pressing the container against the vibrating cup. The degree of mixing may  
15 be varied by altering the pressure of the container against the cup, inclining the container at an angle and/or varying the vibrating speed of the cup. At high speeds a vortex is created in the container, which gives very  
20 efficient and repeatable mixing. Contamination from stirring rods and stoppers is eliminated and different samples may be subjected to the same amount of mixing. The devices are particularly useful for rapidly mixing liquids of  
25 different densities, preparation of liquid emulsions and agitation of micro test tubes.

Conventionally the cup is made to vibrate by mounting the cup on a drive assembly which comprises a bearing housing rotatably  
30 mounted to undergo orbital motion relative to a drive shaft. Rotational motion of the bearing housing about its axis is constrained by a spring or pivot arrangement such that the cup, which is attached to the bearing housing,  
35 e.g. by a screw, undergoes a vibratory motion on actuation of the drive shaft. This drive assembly suffers from the disadvantages that the constraining spring or pivot has a relatively short working life. In addition known  
40 mixing devices are difficult to service, expensive to maintain and have a multiplicity of parts which requires a large replacement stock to be maintained.

According to the invention there is provided  
45 a vibrating cup mixing device comprising a housing and a cup and drive assembly, the cup and drive assembly including a flexible cup rotatably mounted to undergo orbital motion relative to a drive shaft and rotational  
50 motion about an axis of rotation parallel to the drive shaft, the rotational motion being constrained by a flexible skirt connected to the housing.

The skirt may be connected indirectly to the  
55 cup, for example it may be attached to a bearing housing upon which the cup is mounted. However, we prefer the skirt to be attached directly to the cup. In a particularly preferred form, the cup and skirt may be  
60 integrally moulded.

The skirt may be of any general shape which permits a flexible portion of the skirt to depend from the cup and drive assembly for connection to the housing. Thus the skirt may  
65 comprise a tube, adapted at one end to en-

gage the cup, and adapted at the opposing end for connection to the housing. The tube may be tapered, bulging or concave. We prefer the skirt to comprise an annulus  
70 adapted to engage the cup, e.g. the underside of the cup, the annulus being provided with a plurality of downwardly depending limbs. We particularly prefer the lower portions of the limbs to be attached to a lower, preferably  
75 resilient, annulus which is adapted to have a push fit engagement with a suitably placed annular detent on the housing. We prefer such a skirt to have from three to six, particularly four limbs.

80 The flexible cup is preferably rotatably mounted on a fly wheel, which in turn is driven by the drive shaft. For a conventional cup of about 50g, we prefer the flywheel to have a mass of 25–250g, more preferably  
85 75–125g.

The cup may be centrally mounted on a housing which is eccentrically mounted on the drive shaft. However, we prefer the cup to be eccentrically mounted on a member which is  
90 centrally mounted on the drive shaft. We particularly prefer the cup to be mounted on a bearing eccentrically mounted on a flywheel which is centrally mounted on the drive shaft.

When the mixing device is provided with a  
95 flywheel, we prefer a cooling vane to be mounted on the flywheel.

The device according to the invention offers the advantage that it has fewer moving parts, is more reliable or is easier to service than  
100 known devices. In addition, the device is more durable and more effective at lower speeds.

According to the invention there is further provided a flexible skirt for use in association with a vibrating cup mixing device comprising  
105 a housing and a cup and drive assembly, the cup and drive assembly including a flexible cup mounted to undergo orbital motion relative to a drive shaft and capable of rotational motion about its axis of rotation, the skirt being adapted for connection to the housing  
110 so as to constrain the rotational motion of the cup.

A preferred embodiment of the invention will now be described with reference to the accompanying schematic drawings in which  
115 *Figure 1* is a side elevation in partial section of a vibrating cup mixing device;

*Figure 2* is an exploded side elevation in partial section of a flexible cup and flexible skirt for use in association with a vibrating cup mixing device.

A mixing device comprises a housing 1 enclosing a cup and drive assembly 2, the cup 3 extending through an opening 4 in the upper surface 5 of the housing 1.

The cup and drive assembly 2 is driven by an electric motor 7 mounted on the base of the housing 1 and comprises a drive shaft 8 provided with a centrally mounted flywheel 9.  
120 A cup mounting 10 is eccentrically mounted

by a ball race 11 on the fly wheel 9, so that the mounting 10 is capable of undergoing orbital motion about the axis of rotation of the mounting 10 which is parallel to the drive shaft 8. A cooling vane 12 is provided on the upper face of the flywheel 9 adjacent the rim of the flywheel.

The flexible cup 3 of generally conventional configuration is attached to the upper end of the cup mounting 10 by a screw 13. The cup 3 comprises a central well 14 and an outer horizontal flange 15 which encircles the lower portion of the cup 3. A frusto conical cowling 16 downwardly depends from the outer edge of the flange 15. A flexible skirt 17, which is shown more clearly in figure 2 constrains the rotational motion of the cup 3. The skirt 17 comprises an upper annulus 18 (which forms a push fit engagement with the cup 3) immediately below the flange 15, provided with four downwardly depending limbs 19. The four limbs 19 are linked at their lower ends by a lower annulus 20 which forms a press fit engagement with an annular detente 21 which surrounds the opening 4. The upper and lower annuli 18, 20 and limbs 19 are preferably formed from an integral moulding, e.g. of neoprene.

In operation, rotation of the flywheel 9 by actuation of the motor 7 causes the mounting 10 to orbit below the axis of rotation of the flywheel 9. The rotational motion of the mounting 9 about its own axis is constrained by the skirt 17, such that the cup 3 undergoes a vibrating motion. A container holding substances for mixing, e.g. a test tube, is agitated by pressing against the cup 3.

In a particularly preferred embodiment, the motor 7 is actuated by means of a pressure switch 22 upon which the motor 7 is bearing, such that downward pressure on the cup 3, by e.g. a test tube, actuates the switch 22 and supplies power to the motor 7.

#### 45 CLAIMS

1. A vibrating cup mixing device comprising a housing and a cup and drive assembly, the cup and drive assembly including a flexible cup rotatably mounted to undergo orbital motion relative to a drive shaft and rotational motion about an axis of rotation parallel to the drive shaft, the rotational motion being constrained by a flexible skirt connected to the housing.

2. A mixing device according to claim 1, wherein the skirt is attached directly to the cup.

3. A mixing device according to claim 1 or claim 2, wherein the skirt comprises an upper annulus provided with a plurality of downwardly depending limbs, the lower portions of the limbs being attached to a lower annulus.

4. A mixing device according to claim 3, wherein the skirt is provided with from 3 to 6

limbs.

5. A mixing device according to any one of the preceding claims, wherein the flexible cup is rotatably mounted on a flywheel.

6. A mixing device according to claim 5, wherein the flywheel has a mass of from 25-250g.

7. A mixing device according to any one of the preceding claims, wherein the cup is eccentrically mounted on a member which is centrally mounted on the drive shaft.

8. A flexible skirt for use in association with a vibrating cup mixing device comprising a housing and a cup and drive assembly, the cup and drive assembly including a flexible cup rotatably mounted to undergo orbital motion relative to a drive shaft and rotational motion about an axis of rotation parallel to the drive shaft, the skirt being adapted for connection to the housing so as to constrain the rotational motion of the cup.

9. A vibrating cup mixing device substantially as herein described and with reference to the accompanying drawings.

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**TITLE:** Mixing appts. comprises vibrated flexible cup  
driven to orbit and also rotate against  
constraint of flexible skirt

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**BASIC-ABSTRACT:**

The appts. comprises a flexible cup which is driven to follow an orbital path and also rotate. The rotational motion of the cup is constrained by a flexible skirt mounted on a housing for supporting the cup and its drive assembly, so that the cup is vibrated due to the effects of the skirt.

Opt. the skirt is attached to the cup and contacts the housing.

USE - Mixing contents of containers such as test tubes by pressing them against the vibrating cup.

**TITLE-TERMS:** MIX APPARATUS COMPRISE VIBRATION  
FLEXIBLE CUP DRIVE ORBIT ROTATING  
CONSTRAIN SKIRT

**DERWENT-CLASS:** J02

**CPI-CODES:** J02-A02;

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